Tests March 3rd and 9th

Quiz and Coulomb's Law

There is a net attraction to the wall by the balloon because the opposite charge is closer, so we can deduce that electrostatic force is dependent on the distance between the charges.

Coulombs Law:

$F_e = kQq/r^2$

F_e is the electrostatic force, in Newtons.
Q q is the charge, in Coulombs, C.
one electron or proton has a charge of
$e = 1.602 \times 10^{-19}C$
r is distance between the centre of the charges, in metres, m.
k is Coulomb's constant $9.00 \times 10^9\ Nm^2/C^2$

(note the parallels with gravity, $F_g=GMm/r^2$)

eg. An electron orbits a proton in a non-quantum Hydrogen atom. The radius of the atom is $5.0 \times 10^{-11}m$.

a) what is the electrostatic force between the

electron and the proton?

b) if the mass of an electron is 9.11×10^{-31}kg, what is the acceleration of the electron?

c) if it is in uniform circular motion, what is the velocity and period of revolution of the electron?

p436 Questions 1,3,5,7,10,12
p437 problems 1-13 odds

eg. An electron orbits a proton in a non-quantum Hydrogen atom. The radius of the atom is 5.0×10^{-11}m.

a) what is the electrostatic force between the electron and the proton?

$F_e = kQq/r^2 =$
$9.0E9 \times 1.602E\text{-}19 \times (-1.602E\text{-}19)/(5E\text{-}11)^2 =$

-9.2×10^{-8}N the negative means attraction

b) if the mass of an electron is 9.11×10^{-31}kg, what is the acceleration of the electron?

$a = F/m = 9.2/9.11 = 1.0099$
1.0×10^{23} m/s^2 towards the proton

c) if it is in uniform circular motion, what is the velocity and period of revolution of the electron?

$v^2/r=a$

$v = \sqrt{(1.0 \times 10^{23} \times 5 \times 10^{-11})} = 2.2 \times 10^6 m/s$

$4\pi^2 r/T^2 = a \quad T = \sqrt{(4\pi^2 r/a)} = 1.4 \times 10^{-16} s$